REMARKS

Claims 46-51, which were presented in the Amendment; Response to the Office Action Mailed October 31, 2002 (PTO Paper No. 9), were withdrawn from consideration by the Examiner because they are "directed to an invention that is independent or distinct from the invention originally claimed." (Final Office Action -- page 2). Therefore, claims 21-40 are pending in the case. Further examination and reconsideration of pending claims 21-40 are hereby respectfully requested.

Section 112, 1st Paragraph, Rejections

Claims 21-40 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in a manner as to enable one skilled in the art to make and/or use the invention. In particular, the Final Office Action asserts that discrepancies exist between the lens data included on pages 13-15 and the illustrations of Figs. 2-4. As will be set forth in more detail below, the § 112, first paragraph, rejections of claims 21-40 are respectfully traversed.

The Final Office Action states, in reference to the lens data on page 13, that "it is not understood why applicant has disclosed that both surfaces (22 and 24) have positive values, i.e., 50.470." (Final Office Action -- page 4). The Final Office Action cites a similar discrepancy with surfaces 24, 25 and 26 of the lens data included on page 14. Applicant agrees with the Examiner's assertion that positive and negative signs for surfaces of optical elements should be consistent within a system. Such a reference of positive and negative signs, however, does not necessarily have to follow the direction of the incident light beam as contended in the Final Office Action. The Final Office Action states "if the surface of an optical element having a convex configuration with respect to the direction of the incident light beam is assigned as a positive sign then the surface of an optical element having a concave configuration with respect to the direction of the incident light beam must be assigned as a negative sign." (Final Office Action -- page 4). Such an assignment of signs may not, however, consistently represent concave and convex configurations of surfaces within a system. As such, in some cases, positive and negative signs may alternatively be assigned to indicate a concave or convex configuration relative to the direction of other optical elements within the system rather than the direction of the incident light beam. In such a case, the spacing between surfaces may be used to indicate the direction of the incident beam of light as shown, for example, in the tables of lens data on pages 13 and 14 of the Specification. In this manner, the signs associated with the

radii of curvatures may consistently represent either a concave or a convex configuration of surfaces within the system.

Applicant asserts that such a representation of data is commonly known and accepted by those skilled in the art. For example, such a representation of data is included within a previously cited reference, U.S. Patent No. 5,031,976 to Shafer. In particular, U.S. Patent No. 5,031,976 includes a table of lens data in columns 6 and 7, lines 51-69 and lines 1-6, respectively, which includes surfaces #11, #13 and #15 representing the fused silica surface of mirror 50. As shown in the lens data table of U.S. Patent No. 5,031,976, the radius of curvature of surfaces #11, #13 and #15 are each valued at 142.672 mm. Even though the incident light beam approaches surfaces #11, #13 and #15 at different directions, none of the values for surfaces #11, #13 and #15 include a negative sign. Rather, the thickness data corresponding to surfaces #11, #13 and #15 within the lens data table has negative and positive signs which reflect the direction of the incident light beam. As such, the manner in which the lens data for Figs. 2 and 3 are represented on pages 13 and 14 of the presently claimed case is asserted to be correct and recognized by those skilled in the art. Consequently, it is asserted that the tables of lens data on pages 13 and 14 are shown in a manner as to enable one skilled in the art to make and/or use the invention.

The Final Office Action states that "It is also noted that applicant ahs referred to the Patent No. 5,031,976 to support for the applicant's position relating to the assignment of the signs for optical elements...The Examiner in charge of the present application is not responsible for the correctness of any reference not being examined by the same examiner." (Final Office Action -- page 8). Applicant agrees that the Examiner is not responsible for references not examined by the same Examiner. However, the Examiners who examined U.S. Patent No. 5,031,976 can be assumed to be persons of ordinary skill in the art. Therefore, such a reference provides a benchmark or an example of what may be considered accepted manners of representing lens data known to those of ordinary skill in the art. In particular, Primary Examiner Bruce Y. Arnold and Assistant Examiner Martin Lerner, who examined this patent and who may be considered persons of ordinary skill in the art, recognized such a representation of lens data as correct.

Furthermore, it is noted that the present application is related to a family of patents that have the same specification. For example, U.S. Patent Nos. 5,717,518 to Shafer et al., 5,956,174 to Shafer et al., 6,133,576 to Shafer et al., and 6,313,467 to Shafer et al. are all related to the present application, and all have the same specification as the present application. It is further noted that these issued patents all include the same lens data as that of the Specification of the present invention. Primary Examiner Jon W.

Henry, Primary Examiner Constantine Hannaher, and Assistant Examiner Andrew Israel conducted the examination of these patents. Since these Examiners can be assumed to be persons of ordinary skill in the art, and since it can be assumed that the Examiners understood the lens data included on pages 13-15 and the illustrations of Figs. 2-4 as enabling description since the lens data was not altered during prosecution, it is asserted that one of ordinary skill in the art would be able to make and/or use the invention based on the description of the invention provided in the Specification.

Moreover, Applicant respectfully asserts that the lens data of the specification, the detailed description of the lenses, and the detailed drawings of the lens system, in combination, are sufficient to enable one of ordinary skill in the art to make and/or use the invention.

For at least the reasons set forth above, it is asserted that the subject matter of claims 21-40 is described in a manner such that one skilled in the art would be able to make and/or use the invention. Accordingly, removal of the § 112, first paragraph, rejections of claims 21-40 is respectfully requested.

Section 103 Rejections

Claims 21-40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,031,977 to Gibson (hereinafter "Gibson"). As will be set forth in more detail below, the § 103 rejections of claims 21-40 are respectfully traversed.

To establish a *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP 2143.03. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond,* 910 F. 2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). The cited art does not teach or suggest all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

Gibson does not teach or suggest an inspection system which is configured to detect defects on an object using the image of the object. Independent claim 21 recites in part: "A broad band ultraviolet achromatic catadioptric inspection system ... configured to detect defects on the first or second object using the image of the first or second object, respectively." Independent claim 37 recites a similar limitation.

Gibson discloses a deep ultraviolet (UV) lens for use in a photolithography system. However, Gibson does not teach, suggest, or provide motivation for an inspection system which is configured to detect defects on an object using the image of the object. For example, the system of Gibson is a photolithography system. Therefore, the system of Gibson would have to be substantially modified if it is to be configured to detect defects on an object. For example, assuming for the sake of argument that the system of Gibson may be modified for reticle inspection by placing a detector at the object plane (e.g., object plane 18 shown in Fig. 1 of Gibson), then the detector would be positioned where a wafer would normally be placed in the system. As such, such a modification would render the system of Gibson unsuitable for photolithography since an image of the reticle could not be formed on the wafer. Instead, the image would be formed on the detector. Therefore, such a modification would change the principle of operation of the invention of Gibson. Consequently, the teachings of Gibson are not sufficient to render the claims *prima facie* obvious. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). MPEP 2143.01.

In addition, Gibson states that "the present invention is intended to be utilized in a photolithography system for forming patterns on semiconductor wafers." (Gibson -- col. 1, lines 8-10). Gibson also states that "it is an object of the present invention to provide an improved deep ultraviolet (UV) lens for use in a photolithography system." (Gibson -- col. 1, lines 48-50). For at least the reasons provided above, modifying the system of Gibson such that it can detect defects on an object would render the system of Gibson unable to perform photolithography. Therefore, such a modification would render the invention of Gibson being modified unsatisfactory for its intended purpose. Consequently, there is no suggestion or motivation to modify the system of Gibson such that it is configured to detect defects on an object. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). MPEP 2143.01.

Furthermore, even if the system of Gibson can be modified such that it can detect defects on an object, the prior art does not suggest the desirability of such a modification. For example, Gibson does not suggest the desirability of using the system for anything other than photolithography. Instead, Gibson specifically discloses the desirability of using the system for photolithography. For example, Gibson

discloses several problems in photolithography applications that the improved deep ultraviolet lens overcomes. In particular, Gibson states:

> with increasing demands for higher resolution capabilities from such systems, applicant has recognized a need to modify the system so that even higher numerical apertures and higher resolution may be obtained while maintaining acceptable field size. While the subject matter described in the '494 patent is quite suitable for normal photolithography aspects, such approaches have not provided sufficient capability in deep ultraviolet (UV) photolithography applications. (Gibson -- col. 1, lines 37-45).

In addition, Gibson states that "a deep ultraviolet (UV) lens for use in a photolithography system provides enhanced resolution by using shorter wavelengths of light exposure (in the ultraviolet wavelength)." (Gibson -- Abstract). Gibson further states that "the present invention provides for operation in the deep ultraviolet range with a aperture in one embodiment of 0.350." (Gibson -- Abstract). Therefore, Gibson suggests the desirability of incorporating the lens of Gibson into a photolithography system since the lens overcomes problems with prior art photolithography systems. However, Gibson does not suggest the desirability of incorporating the lens into an inspection system. Furthermore, Gibson does not suggest the desirability of modifying the photolithography system such that it can detect defects on an object. Consequently, such a modification is not obvious. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). MPEP 2143.01.

For at least the reasons stated above, Gibson does not teach, suggest, or provide motivation for an inspection system which is configured to detect defects on an object using the image of the object, as recited in claims 21 and 37. Consequently, Gibson does not teach, suggest, or provide motivation for all limitations of claims 21 and 37. Therefore, claims 21 and 37, as well as claims dependent therefrom, are patentably distinct over the cited art. Accordingly, removal of the § 103(a) rejections of claims 21-40 is respectfully requested.

Although dependent claims 22-36 and 38-40 are patentably distinct from the cited art for the reasons set forth above, arguments presented in the Final Office Action regarding several of the dependent claims are respectfully traversed.

For example, the arguments regarding the wavelength value and/or range limitations of claims 25, 26 and 28 on page 6 of the Final Office Action are traversed. In particular, the Final Office Action states that the features recited in claims 25, 26 and 28 "are not critical to the invention by the mutually exclusive of the values of the wavelengths claimed. For instance, while the wavelengths of the claim 25 are selected from a group consisting of 193 nm, 248 nm and 365 nm then the wavelengths of claim 28 are 313 nm and 220 nm, which are both are not in the range or the group of wavelengths recited in claim 25." However, claims 25, 26 and 28 are directed toward different embodiments of the presently claimed case and, therefore, are not dependent on each other. Consequently, the claimed values and/or ranges within claims 25, 26 and 28 do not have to nest within each other. Applicant is unaware of any legal precedent which deems different dependent claim features "non-critical" for being directed toward different embodiments of the invention.

In addition, the features recited in these claims provide significant advantages over the prior art. For example, inspection systems known in the art are generally designed to inspect an object at only one wavelength or at a narrow range of wavelengths. Since the resolution of an inspection system depends on the wavelength of the inspection system (e.g., a shorter wavelength provides greater resolution), an inspection system designed for use at only one or a narrow range of wavelengths provides little flexibility in the objects that it can inspect. For example, an inspection system that is designed to operate at or near 248 nm may not be able to image a resist that was patterned at 193 nm due to the feature sizes of the patterned resist. In addition, it is advantageous to inspect certain objects such as reticles at the wavelengths at which they are to be used. Therefore, inspection systems that are designed to operate at only one or a narrow range of wavelengths may not be suitable for different types of reticles (e.g., reticles to be used at 248 nm and reticles to be used at 193 nm).

The Final Office Action further states that "it would have been obvious to one skilled in the art to utilize any kind of light sources whose wavelengths are in the range of deep ultraviolet for an exposure process from a reticle to a wafer using the lens system provided by Gibson to obtain a good resolution due to the different materials of the lens elements." (Final Office Action -- page 6). Applicant respectfully traverses this assertion.

For example, the wavelength of light that is used by a photolithography system is determined by the resist material being imaged <u>not</u> the materials of the lens elements. Instead, as is known to one of ordinary skill in the art, there are certain industry agreed upon wavelengths (e.g., 193 nm, 248 nm, 365 nm,

etc.) at which resists and corresponding exposure tools are developed. Such agreed upon wavelengths are necessary such that different companies can work toward producing resists and photolithography systems that can be used together at a common wavelength. Otherwise, the resists and the photolithography systems will be useless.

However, as is well known to one of ordinary skill in the art, photolithography systems are designed for only one of these wavelengths. For example, a photolithography system that is designed for 248 nm cannot be used for 193 nm since each optical component of a photolithography system (e.g., light source, condenser lens, objective lens, reticle, aperture, degree of coherence, etc.) varies depending on the wavelength. For example, a lens that is used in a 248 nm photolithography system may be significantly damaged in a 193 nm photolithography system thereby resulting in failure of the photolithography system. Therefore, since Gibson discloses that the system can use two wavelengths, 243.8 and 249.8 which are close to 248 nm, the photolithography system of Gibson would be characterized by one of ordinary skill in the art as a 248 nm photolithography system.

Therefore, it is not obvious that the photolithography system of Gibson can be used at the other claimed wavelengths since it is known to one of ordinary skill in the art that photolithography systems are designed for one target wavelength and that photolithography systems can only be used for that target wavelength. In addition, as is known to one of ordinary skill in the art, photolithography systems for different wavelengths are substantially different (different light sources, different lenses, different lens materials, different numerical apertures, different reticles, different reticle materials, etc.) and can take years to design and develop. There is, therefore, absolutely no reasonable expectation of success that the system of Gibson can be used at wavelengths other than those disclosed by Gibson. Consequently, Gibson cannot be modified to teach all limitations of claims 25, 26, and 28. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). MPEP 2143.02. Evidence showing there was no reasonable expectation of success may support a conclusion of nonobviousness. *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CPA 1976). MPEP 2143.02. Consequently, the features of claims 25, 26, and 28, in combination with the features of independent claim 21, do not appear to be taught or suggested by the cited art.

Furthermore, although claim 29 is patentably distinct over the cited art for being dependent upon independent claim 21, it is believed that the subject matter of claim 29 is separately patentable for the

following reasons. Claim 29 specifies that the field size of the objective has a diameter of at least approximately 0.5 mm. Gibson does not disclose a field size for the objectives described therein. In fact, it appears that the intention of Gibson is to create a photolithography system which maintains field size in a range which is commensurate with prior systems. For example, Gibson states that "with increasing demands for higher resolution capabilities from such systems, applicant has recognized a need to modify the system so that even higher numerical apertures and higher resolution may be obtained while maintaining acceptable field size." (Gibson, column 1, lines 37-41). As such, one skilled in the art may presume that the field size of the objectives taught by Gibson would be substantially similar to those of prior art objectives, absent any teaching or suggestion otherwise. The presently claimed case discloses that "prior narrow band UV lenses [to] have a field size on the order of 0.1 mm or less." (Specification -- pages 17-18, lines 38 and 1, respectively). As such, one skilled in the art may presume that the field size of the objectives taught by Gibson would be approximately 0.1 mm or less. Consequently, claim 29 is asserted to be patentably distinct over the cited art.

Claim 33 recites, in part "further comprising an excimer laser configured to illuminate the first and second objects with ultraviolet light at the first and second ultraviolet wavelengths, respectively." Claim 40 recites a similar limitation. The features of these claims, in combination with the features of independent claims 21 and 37, respectively, do not appear to be taught or suggested by the cited art.

Claim 34 recites, in part "wherein the objective is further configured to image the first and second objects with light scattered by the first and second objects, respectively." Claim 39 recites a similar limitation. Such a feature is advantageous since an image of an object that is formed with light scattered by the object will allow detection of defects having smaller dimensions than those which may be detected using bright field imaging. The Final Office Action states:

> With regard to the features concerning the scattered light from the objects...as recited in claims 34, 36, and 39, such features are clearly inherent from the system provided by Gibson without any specific limitations recited in the present claims. In particular, since the reticle comprises different areas and the different areas are illuminated to form images in a wafer; therefore, any scattered light from the reticle will be guide/imaged onto the wafer. (Final Office Action -- page 6).

Applicant respectfully traverses this assertion. For example, Gibson only discloses a photolithography system. As is known to one of ordinary skill in the art, photolithography systems are specifically designed to minimize the amount of light scattered from the reticle that reaches the wafer since any scattered light that reaches the wafer during exposure will adversely alter the image formed on the wafer by, for example,

reducing the contrast of the image, which in turn will reduce the resolution of the image. Therefore, photolithography systems are generally designed to have numerical apertures that prevent light scattered from the reticle from reaching the wafer. For example, the numerical aperture of a photolithography system may be selected such that the scattered light falls outside of the aperture and therefore is not directed to the wafer. Consequently, Gibson does not teach, suggest, or provide motivation for all limitations of claims 34 and 39.

Claim 35 recites, in part "further comprising a ring dark field illumination source configured to illuminate the first and second objects with ultraviolet light at the first and second ultraviolet wavelengths, respectively." The features of this claim, in combination with the features of independent claim 21, do not appear to be taught or suggested by the cited art.

Claim 36 recites, in part "wherein the system is further configured to classify defects and features on the first or second object using the image of the first or second object, respectively." The Final Office Action states, "The classification of the defects/features of the different areas of the reticle is also recognized/observed by a user during the process of exposure the reticle to ultraviolet light." (Final Office Action -- page 6 - page 7). Assuming for the sake of argument that a user of the system of Gibson could classify defects on a wafer, there is still no teaching or suggestion in the art that the system of Gibson could be configured for such classification. Consequently, the features of this claim, in combination with the features of independent claim 21, do not appear to be taught or suggested by the cited art.

The Final Office Action states that "since the presently claims do not recite any specific limitations for the system except the recitation that the system is configured to detect defects and the system and the user/observer in the art of Gibson is a system in a general view/status." (Final Office Action -- page 9). Although this statement is somewhat unclear to the Applicant, it appears that the Examiner is asserting that the claims do not recite any limitations other than that the system is configured to detect defects on the first or second object using the image of the first or second object, respectfully. If that is the case, Applicant respectfully traverses this assertion. For example, upon reviewing the claims, it should be obvious to the Examiner that the claims include additional limitations which, in combination with the specific feature that "the system is configured to detect defects on the first or second object using the image of the first or second object, respectfully," render the claims patentably distinct over the cited art.

CONCLUSION

This response constitutes a complete response to all of the issues raised in the Final Office Action mailed June 3, 2003. In view of the remarks traversing rejections, Applicants assert that pending claims 21-40 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned agent earnestly requests a telephone conference.

No fees are required for filing this amendment; however, the Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment, to Conley Rose, P.C. Deposit Account No. 03-2769/5589-00807.

Respectfully submitted,

Ann Marie Mewherter
Reg. No. 50,484
Agent for Applicants

Conley Rose, P.C.
P.O. Box 684908
Austin, TX 78768-4908
Ph: (512) 476-1400

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